

REMARKS

Claims 1-8 were pending. Claims 1, 3, and 5 have been amended. Claims 6-8 have been canceled without prejudice or disclaimer. New claims 9-17 have been added. Reexamination and reconsideration of the present application is respectfully requested.

At the outset, the Examiner is thanked for the thorough review and consideration of the present application. The Examiner's Office Action dated June 4, 2003 has been received and the contents carefully noted.

Applicants hereby confirm the election without traverse of claims 1-5.

The specification has been amended to correct a minor informality. No new matter has been added.

In the Office Action, the Examiner objected to claim 5 because of informalities. Regarding the objection, claim 5 has been amended to more clearly indicate its dependency by reciting --any one of claims 1 to 4--. Applicants respectfully request withdrawal of the objection.

The Examiner rejected claims 1 and 2 under 35 USC 103(a) as being unpatentable over Fig. 1B of Applicants' drawings in view of Ishida et al. (US Patent No. 6,177,731). This rejection is respectfully traversed.

Claim 1 is allowable at least for the reason that claim 1 recites a combination of elements, including for example,

“...a magnetic shield layer, which is formed to cover the one of the magnetoresistive devices covered by the organic film through the organic film and the insulating film.”
[emphasis added]

None of the cited references singly or in combination teaches or suggests at least these features of claim 1.

In the present invention, the magnetic sensor overcomes the problem with prior art magnetic sensors by relieving the thermal stress due to the difference in expansion coefficients of components that form the sensor. A flexible organic film is provided between an insulating film for passivation and a magnetic shield layer which covers a silicon substrate. In the magnetic sensor of the present invention, cracking is also prevented in the substrate at the portions covered by the magnetic shield layers.

On page 3 of the Office Action, the Examiner stated that Applicants' Fig. 1B (labeled Related Art) and the discussion in Applicants' own specification does not disclose an organic film used for relieving thermal stress and formed to cover one of the magnetoresistive devices through an insulating film for passivation. The Examiner cited Ishida et al. in an attempt to cure the deficiencies of Applicants' Fig. 1B. Applicants submit that Fig. 1B of Applicants' disclosure is labeled "Related Art" and is not "Prior Art" as asserted by the Examiner. Fig. 1B is a general schematic diagram and has nothing to do with the novel characteristics of the invention.

Ishida et al. teaches a semiconductor package including an organic resin film 27 formed on a main surface of IC chip 10 and having openings on electrode pads through which electrodes 12 protrude. As a result, the protruding electrodes 12 may expand without creating stress between the electrode pad 15 and the IC chip 10 that causes cracking. *See* column 7, lines 27-44. The electrodes 12 have lower melting points than a heat resisting temperature of the organic resin film 27. *See* column 3, lines 1-15.

However, Ishida et al. fails to disclose the features recited in claim 1, namely, a magnetic shield layer, which is formed to cover the one of the magnetoresistive devices through the organic film and the insulating film, to achieve the novel and nonobvious advantages discussed in the present invention.

In addition, Applicants respectfully submit that the references cannot be combined because the secondary reference Ishida et al. is non-analogous art. The problems with the magnetic sensor of Fig. 1B of the specification of this application have been discussed in the Background of the Invention. In Ishida et al. there is no insulating film, magnetic sensor, magnetic shield layer, or any magnetoresistive devices. The secondary reference is neither in the field of Applicants' endeavor or reasonably pertinent to the particular problem with which the inventor is concerned, i.e., the cracking of a magnetic sensor chip fixed to a lead frame at the portion covered by a magnetic shield layer due to changes in temperature from a heat treatment temperature level to a room temperature level. Even *assuming arguendo* that it would be obvious to mount the chip in Ishida et al. on a lead frame rather than a ball grid array and *assuming arguendo* that Fig. 1B was prior art, it is not logical that one of ordinary skill in the art would have also modified Applicants' Fig. 1B by looking to the teachings of Ishida et al. in consideration the problems with prior art magnetic sensors.

The Examiner appears to take the position that a magnetic sensor having an organic film covering a magnetoresistive device through an insulating film would not change and/or alter the performance of any semiconductor package, which is contrary to Applicant's disclosure. Applicants respectfully traverse the Examiner's assertion and respectfully request that the Examiner specifically cite in the next Office Action the

portions of the references that disclose or suggest using and locating an organic film to cover a magnetoresistive device through an insulating film in the manner recited in claim 1 as required by MPEP 2144.03.

As evident in view of the above remarks, Applicants assert that the Examiner has failed to establish a *prima facie* case of obviousness as none of the prongs of the Graham factual inquiries test have been satisfied.

Therefore, Applicants respectfully request that the rejection of claims 1 and 2 under 35 USC 103(a) be withdrawn.

It can thus be understood that the combination of references does not in any way make obvious the essential features of the present invention as set out in independent claim 1.

Moreover, as claim 2 depends from independent claim 1, this claim is also allowable for the same reasons as its respective base claim.

The Examiner rejected claim 3 under 35 USC 103(a) as being unpatentable over the "prior art" in view of Sasaki (US Patent No. 6,315,875). This rejection is respectfully traversed.

Claim 3 is allowable at least for the reason that claim 3 recites a combination of elements, including for example,

"...a magnetic shield layer, which is formed to cover one of the two magnetoresistive devices through an insulating film for passivation and made of a nickel-iron alloy having a nickel content of 69% or less."

None of the cited references singly or in combination teaches or suggests at least these features of claim 3.

The features of the present invention have been discussed above in reference to claim 1. Some of the differences between claim 1 and claim 3 include that the substrate is made of silicon (as amended) and that the magnetic shield layer is made of a Ni-Fe alloy having a nickel content of 69% or less.

On page 5 of the Office Action, the Examiner attempts to cure the deficiencies of the “prior art” (presumably Fig. 1B of Applicants’ own disclosure) which, as discussed above, is inapplicable as a reference as it is not prior art, but related art, by citing Sasaki.

Sasaki teaches a method of manufacturing a thin-film magnetic head and a method of manufacturing a magnetoresistive device. A top shield layer 8 includes a first layer 8a made of a magnetic material, a second layer 8b made of NiFe, and a third layer 8c made of NiFe. The nickel content in the second and third layers 8b and 8c is between 45% to 80% and the layers are used as a high saturation flux density material. *See* column 9, lines 41-50. The top shield layer 8 is formed on a substrate made of Al₂O₃-TiC having various layers therebetween.

Although Sasaki may be more closely related to the field of Applicants’ endeavor than Ishida, Sasaki still fails to cure the deficiencies of Applicants’ disclosure of Fig. 1B, *assuming arguendo* that Fig. 1B would be considered prior art. Specifically, Sasaki fails to disclose the features recited in claim 3, namely, a silicon substrate and a magnetic shield layer having a nickel content of 69% or less, to achieve the novel and nonobvious advantages discussed in the present invention.

Instead, Sasaki uses a substrate made of a material other than silicon and the upper and lower limits of the nickel content of the shield layer are outside the range of the claimed nickel content of 69% or less.

It can thus be understood that the combination of references does not in any way make obvious the essential features of the present invention as set out in independent claim 3.

Therefore, Applicants respectfully request that the rejection of claim 3 under 35 USC 103(a) be withdrawn.

The Examiner rejected claims 4 and 5 under 35 USC 103(a) as being unpatentable over the prior art in view of Sasaki as applied to claim 3 above, and further in view of Ishida et al. This rejection is respectfully traversed.

As discussed above in connection with claim 1, none of the cited references teaches an organic film located in the manner recited in claim 1. As discussed above in connection with claim 3, none of the cited references teaches a silicon substrate or the claimed range of nickel content in the magnetic shield layer. Claim 4 further limits independent claim 3 by reciting a further feature including an organic film. Claim 5 further limits any one of claims 1 to 4 by further reciting that the magnetic shield layer has no undercut.

None of the cited references singly or in combination teaches or suggests at least these features of the claims.

Additionally, on page 6 of the Office Action, the Examiner appears to take Official Notice that a magnetic shield layer having no undercut is well known. However, this is contrary to Applicant's disclosure. In at least Figures 22, 24, and 27-29, Applicants have shown by experimentation different stress levels based on no undercut and alternative types of undercuts. Applicants respectfully request that the Examiner specifically cite the portions of the references that disclose or suggest the motivation for

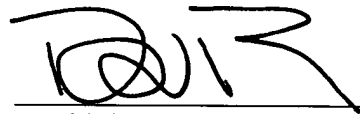
not using an undercut in the magnetic shield layer in the manner recited in claim 5 as required by MPEP 2144.03.

Moreover, as claims 4 and 5 each depend from one of independent claims 1 or 3, these claims are also allowable for the same reasons as their respective base claim.

Newly added dependent claim 9 further limits claim 1 by reciting further features regarding a wiring layer. Newly added dependent claim 10 further limits claim 1 by reciting further features regarding the substrate. Newly added dependent claims 11 and 15 further limit claims 1 and 3, respectively by reciting further features regarding a lead frame. Newly added dependent claim 12 further limits claims 1 by further reciting features regarding the magnetic shield layer. Newly added dependent claims 13 and 16 further limit claims 1 and 3, respectively by reciting further features regarding the organic film. Newly added dependent claim 14 further limits claim 3 by reciting further features regarding a bonding pad. Newly added independent claim 17 recites features similar to independent claims 1 and 3 and no new matter has been added. Applicants respectfully submit that new claims 9-17 are allowable over the cited references.

In view of the above remarks, the present application is believed to be in condition for allowance. A prompt notice to that effect is respectfully requested. A two-month extension and the requisite fee are included with this Amendment. Although no additional fees are believed to be due, permission is hereby given to charge any unforeseen fees to deposit account 50-1147.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'DGP', written over a horizontal line.

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